17. Solve for x from $\cos x - xe^x = 0$ by iteration method correct to 3 decimal places.

18. Solve, by Gauss-Seidal iteration method, the equations

$20x + y - 2z = 17;$

$3x + 20y - z = 18;$

$2x - 3y + 20z = 25.$

19. Using Newton's interpolation formula, find the value of $f(5)$ and $f(9)$, from the following available data:

x	4	6	8	10
$f(x)$	1	3	8	16

20. Use Gauss forward formula to evaluate $y(30)$, given that $y(21) = 18.4708$, $y(25) = 17.8144$, $y(29) = 17.1070$, $y(33) = 16.3432$ and $y(37) = 15.5154$.

NOVEMBER/DECEMBER 2024

23UECA12B/23UEDA12B/23UECS12A/ 23UESC12A — NUMERICAL METHODS — I

Time : Three hours Maximum : 75 marks

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SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write any two exponential curve forms.

2. Write the working procedure to fit the parabola $y = ax^2 + bx + c$.

3. Find an iterative formula to find $\sqrt{N}$.

4. Find an interval of convergence of the equation $x^3 - 4x - 9 = 0$.

5. Write any two iterative methods to solve simultaneous first-order linear equations.

6. Define the diagonally dominant of a system.

7. Prove that $\nabla = 1 - E^{-1}$.

8. Obtain the function whose first difference is $11x + 5$.

9. Write the relation between μ and E.

10. Write the Gauss forward formula.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Fit a law of the type $y = ae^{bx}$ to the data.

x	0	1	2	3
y	1.05	2.1	3.85	8.3

Or

(b) Fit a parabola to the data given below:

x	1	2	3	4
y	1250	1400	1650	1950

12. (a) Find the positive root of $x^3 - x = 1$ correct to three decimal places using bisection method.

Or

(b) Find the positive root of $x = \cos x$ using Newton's method.

13. (a) Solve the following system by triangulation method:

$$x + y + z = 1;$$
$$4x + 3y - z = 6;$$
$$3x + 5y + 3z = 4.$$

Or

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(b) Apply Gauss-Jordan method to solve the equations.

$$x + y + z = 9;$$
$$2x - 3y + 4z = 13;$$
$$3x + 4y + 5z = 40.$$

14. (a) Express $f(x) = x^3 - 3x^2 + 5x + 7$ in terms of factorial polynomial taking $h = 2$ and find its differences.

Or

(b) Evaluate $\Delta(\tan^{-1} x)$.

15. (a) Apply Bessel's formula to obtain $y(25)$, given $y(20) = 2854$, $y(24) = 3162$, $y(28) = 3544$, $y(32) = 3992$.

Or

(b) Employ Stirling's formula to compute $y(12.2)$ from the data $y(10) = 23967$, $y(11) = 28060$, $y(12) = 31788$, $y(13) = 35209$.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Fit a straight line to the following data. Also estimate the value of y at $x = 70$.

x	71	68	73	69	67	65	66	67
y	69	72	70	70	68	67	68	64